

Id Reaction Associated With Red Tattoo Ink

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PRACTICE POINTS

- Hypersensitivity reactions to tattoo pigment are on the rise due to the increasing popularity and prevalence of tattoos. Systemic allergic reactions to tattoo ink are rare but can cause considerable morbidity.
- Id reaction, also known as autoeczematization or autosensitization, is a reaction that develops distant to an initial site of infection or sensitization.
- Further investigation of color additives in tattoo pigments is warranted to better elucidate the components responsible for cutaneous allergic reactions associated with tattoo ink.

To the Editor:

Although relatively uncommon, hypersensitivity reactions to tattoo pigment are on the rise due to the increasing popularity and prevalence of tattoos.¹ Multiple adverse events have been described in association with tattoos, including inflammatory, infectious, and neoplastic responses.² An id reaction (also known as autoeczematization or autosensitization) develops distant to an initial site of infection or sensitization. We describe a unique case of an id reaction and subsequent development of prurigo nodules associated with contact allergy to red tattoo ink.

A 40-year-old woman was referred to the New York University Skin and Cancer Unit (New York, New York) for evaluation of a pruritic eruption arising on and near sites of tattooed skin on the right foot and right upper arm of 8 months' duration. The patient reported that she had obtained a polychromatic tattoo on the right dorsal foot 9 months prior to the current presentation. Approximately

1 month later, she developed pruritic papulonodular lesions localized to the red-pigmented areas of the tattoo. Concomitantly, the patient developed a similar eruption confined to areas of red pigment in a polychromatic tattoo on the right upper arm that she had obtained 10 years prior. She was treated with intralesional triamcinolone to several of the lesions on the right dorsal foot with some benefit; however, a few days later she developed a generalized, erythematous, pruritic eruption on the back, abdomen, arms, and legs. Her medical history was remarkable only for mild iron-deficiency anemia. She had no known drug allergies or history of atopy and was not taking any medications prior to the onset of the eruption.

Skin examination revealed multiple, well-demarcated, eczematous papulonodules with surrounding erythema confined to the red-pigmented areas of the tattoo on the right dorsal foot, with several similar lesions on the surrounding nontattooed skin (Figure 1). Linear, well-demarcated, eczematous, hyperpigmented plaques also were noted on the red-pigmented areas of the tattoo on the patient's right upper arm (Figure 2). Eczematous plaques and scattered excoriations were noted on the back, abdomen, flanks, arms, and legs.

Patch testing with the North American Standard Series, metal series, and samples of the red pigments used in the tattoo on the foot were negative. A punch biopsy of a lesion on the dorsal right foot showed a psoriasisiform spongiotic dermatitis with eosinophils (Figure 3). Periodic acid-Schiff staining with diastase failed to reveal fungal hyphae. The histologic findings were consistent with allergic contact dermatitis. A punch biopsy of the eczematous reaction on nontattooed skin on the trunk demonstrated a perivascular dermatitis with eosinophils and subtle spongiosis consistent with an id reaction.

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FIGURE 1. Papulonodular lesions localized to red-pigmented areas of a tattoo on the right dorsal foot.



FIGURE 2. Linear, well-demarcated, hyperpigmented plaques localized to red-pigmented areas of a tattoo on the right upper arm.

The patient was treated with fluocinonide ointment for several months with no effect. Subsequently, she received several short courses of oral prednisone, after which the affected areas of the tattoo on the arm and foot flattened and the id reaction resolved; however, after several months, the red-pigmented areas of the tattoo on the foot again became elevated and pruritic, and the patient developed widespread prurigo nodules on nontattooed skin on the trunk, arms, and legs. She was subsequently referred to a laser specialist for a trial of fractional laser treatment to cautiously remove the red tattoo pigment. After 2 treatments, the pruritus improved and the papular lesions appeared slightly flatter; however, the prurigo nodules remained. The tattoo on the patient's foot was surgically removed; however, the prurigo nodules remained. Ultimately, the lesions cleared with a several-month course of mycophenolate mofetil.

Systemic allergic reactions to tattoo ink are rare but can cause considerable morbidity. An id reaction, also known as autoeczematization or autosensitization, is a reaction that develops distant to an initial site of infection or sensitization. Although the pathogenesis of this reaction is not certain, it has been hypothesized that autoimmunity to skin antigens might play a role.³ Autologous epidermal cells are thought to become antigenic in the presence of acute inflammation at the primary cutaneous site. These antigenic autologous epidermal cells are postulated to enter the circulation and cause secondary eczematous lesions at distant sites. This proposed

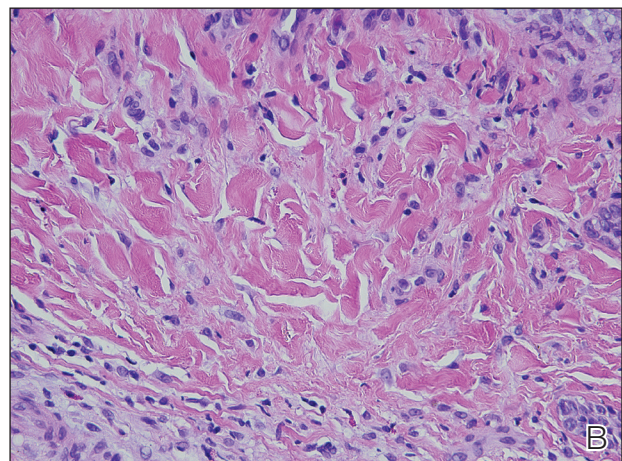
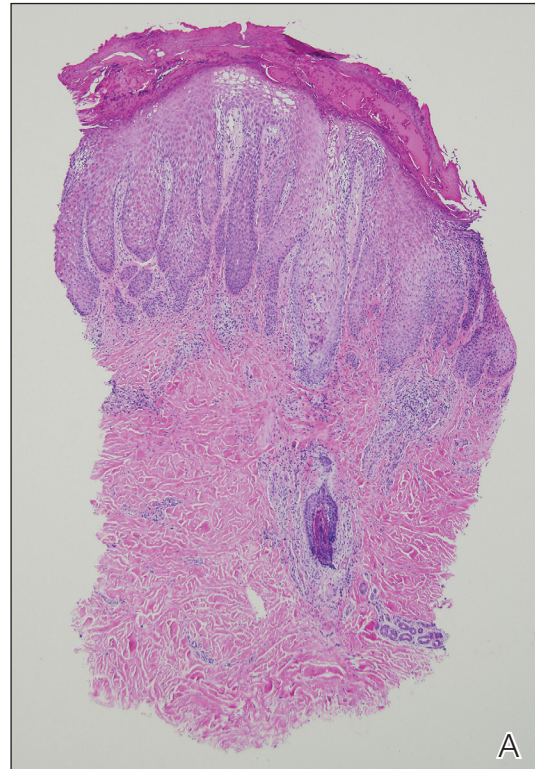


FIGURE 3. A punch biopsy of a lesion on the dorsal right foot showed a psoriasiform spongiotic dermatitis with eosinophils. Vertically oriented collagen bundles were noted within the papillary tips (A) and numerous eosinophils within the infiltrate (B)(H&E, original magnifications $\times 4$ and $\times 40$, respectively).

mechanism is supported by the development of positive skin reactions to autologous extracts of epidermal scaling in patients with active id reaction.³

Hematogenous dissemination of cytokines has been implicated in id reactions.⁴ Keratinocytes produce cytokines in response to conditions that are known to trigger id reactions.⁵ Epidermal cytokines released from the primary site of sensitization are thought to heighten sensitivity at distant skin areas.⁴ These cytokines regulate both

cell-mediated and humoral cutaneous immune responses. Increased levels of activated HLA-DR isotype-positive T cells in patients with active autoeczematization favors a cellular-mediated immune mechanism. The presence of activated antigen-specific T cells also supports the role of allergic contact dermatitis in triggering id reactions.⁶

Allergic contact dermatitis is the most common hypersensitivity reaction to tattoo ink, with red pigments representing the most common cause of tattoo-related allergic contact dermatitis. Historically, cinnabar (mercuric sulfide) has been the most common red pigment to cause allergic contact dermatitis.⁷ More recently, mercury-free organic pigments (eg, azo dyes) have been used in polychromatic tattoos due to their ability to retain color over long periods of time⁸; however, these organic red tattoo pigments also have been implicated in allergic reactions.⁸⁻¹¹ The composition of these new organic red tattoo pigments varies, but chemical analysis has revealed a mixture of aromatic azo compounds (eg, quinacridone),¹⁰ heavy metals (eg, aluminum, lead, cadmium, chromium, cobalt, iron, titanium),^{9,12} and intermediate reactive compounds (eg, naphthalene, 2-naphthol, chlorobenzene, benzene).⁸ Allergic contact dermatitis to red tattoo ink is well documented^{8,13}; however, a PubMed search of articles indexed for MEDLINE using the terms *tattoo and dermatitis*, *tattoo and allergy*, *tattoo and autosensitization*, *tattoo and id reaction*, and *tattoo and autoeczematization* yielded only 3 other reports of a concomitant id reaction.^{11,14,15}

The diagnosis of id reaction associated with allergic contact dermatitis is made on the basis of clinical history, physical examination, and histopathology. Patch testing usually is not positive in cases of tattoo allergy; it is thought that the allergen is a tattoo ink byproduct possibly caused by photoinduced or metabolic change of the tattoo pigment and a haptenization process.^{1,8,16} Histologically, variable reaction patterns, including eczematous, lichenoid, granulomatous, and pseudolymphomatous reactions have been reported in association with delayed-type inflammatory reactions to tattoo pigments, but the lichenoid pattern is most commonly observed.⁸

Treatment options for allergic contact dermatitis to tattoo ink include topical, intralesional, and oral steroids; topical calcineurin inhibitors; and surgical excision of the tattoo. Q-switched lasers—ruby, Nd:YAG, and alexandrite—are the gold standard for removing tattoo pigments¹⁷; however, these lasers remove tattoo pigment by selective photothermolysis, resulting in extracellular extravasation of pigment, which can precipitate a heightened immune response that can lead to localized and generalized allergic reactions.¹⁸ Therefore, Q-switched lasers should be avoided in the setting of an allergic reaction to tattoo ink. Fractional ablative laser resurfacing may be a safer alternative for removal of tattoos in the setting of an allergic reaction.¹⁷ Further studies are needed to

confirm the safety and efficacy of this modality for allergic tattoo ink removal.^{17,18}

Our case illustrates a rare cause of id reaction and the subsequent development of prurigo nodules associated with contact allergy to red tattoo ink. We present this case to raise awareness of the potential health and iatrogenic risks associated with tattoo placement. Further investigation of these color additives is warranted to better elucidate ink components responsible for these cutaneous allergic reactions.

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